Comments of

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On behalf of Williams Energy Services and the members of the Renewable Fuels Association, the national trade association for the domestic ethanol industry, I want to thank the panel for the opportunity to provide comments on the use of ethanol in reformulated gasoline (RFG) markets and the potential for increased production and use. I speak to you today, holding no position regarding the more fundamental questions this panel must answer, i.e., whether MTBE poses a health or environmental risk and whether its use in RFG should be curtailed in order to protect water supplies. I am not a hydrologist, nor a toxicologist. What I can tell you, however, is that if you determine that MTBE use should be reduced, ethanol most certainly can fill the void and supply the entire RFG oxygenate market if necessary.

Williams Energy is a fortune 500 company with more than $18 billion in assets and 20,000 employees nationwide. Williams provides a full range of traditional and leading-edge communications and energy services, and is one of the United States' largest volume-transporter of natural gas with more than 27,000 miles of pipeline stretching from coast to coast. Williams Energy Services is also the second-largest fuel ethanol producer in the country, operating a 100 million gallon per year (gpy) wet milling plant in Pekin, Illinois and a 30 million gpy dry-milling plant in Aurora, Nebraska.

Ethanol Supply:

There seems to be a reflexive assumption that because MTBE currently controls almost 90% of the RFG oxygenate market, there is no way for ethanol to supply the market in MTBE's absence. This assumption is reinforced by petroleum interests and others that would like to take advantage of the MTBE situation to repeal the RFG oxygen requirement all together. But I am here to tell that is not necessary.

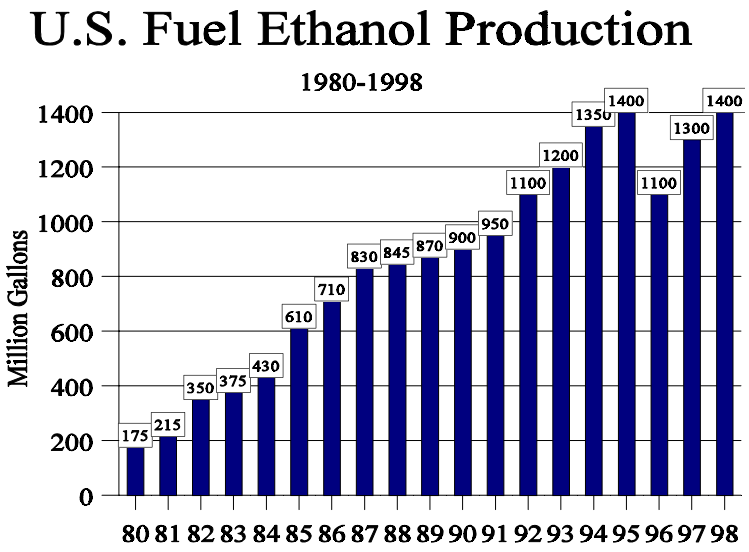
Current MTBE usage in RFG markets is approximately 250,000 barrels per day (b/d) or 3.8 billion gallons per year. Current ethanol production is about 100,000 b/d or 1.5 billion gallons per

year. Existing production capacity is approximately 1.8 billion gallons per year (a list of current U.S. ethanol production facilities is attached). But it would not take as much ethanol by volume as it does MTBE to meet the 2.0 wt. percent % oxygen requirement. Because ethanol has twice the oxygen content as MTBE, the 2.0 wt.% oxygen requirement can be met by either 11% volume MTBE or 5.7% volume ethanol. Thus, in fuel ethanol units, the RFG oxygen demand is approximately 125,000 b/d, or roughly 2 billion gallons annually. With existing capacity not currently in production (approximately 400 million gallons), the U.S. ethanol industry can satisfy 90% of the RFG oxygenate demand today!

But nobody is suggesting that MTBE be removed from the nation's fuel supply – today. California Governor Gray Davis has allowed almost four years to phase out the use of MTBE. Legislation has been introduced in the U.S. House of Representatives to phase out MTBE use over three years (H.R. 1367, Rep. Franks). It took the oil industry several years to ramp up MTBE production and get into MTBE blending; it would be prudent to allow some time for a transition out of MTBE. Moreover, the ethanol industry would obviously want to preserve existing octane markets in the Midwest. Our goal would be to ramp up production capacity to meet the new demand. Rapid expansion in ethanol production has been done in the past. With the assurance of new markets, it can certainly be achieved again.

Table 1

As noted in Table 1, U.S. ethanol production rose more than 50% (from 900 million gallons to 1.4 billion gallons annually) from 1990 to 1995 in anticipation of increased market opportunities in RFG areas. Much of this new growth was in farmer-owned cooperatives where farmers invested their own money to take direct advantage of the value-added economic benefits of ethanol production. My own company, Williams Energy Services expanded production by 20% at our plant in Pekin, and built a new 30 million gallon facility in Aurora, Nebraska with a farmer-owned cooperative. Our experience was not unique; virtually every existing ethanol plant expanded in the years following the 1990 Clean Air Act Amendments, and would do so again with the certainty of new markets for ethanol in RFG.



Source: Energy Information Administration and Renewable Fuels Association

The question has been asked, what would it take to assure increased ethanol production, and will investment capital be available? The answer is relatively straight forward. Investment capital will flow with the assurance of increased market demand. In the current climate, capital has been constrained by the questions regarding ethanol's potential use in phase 2 RFG and the clear preference by the refining industry to use its own petroleum-derived oxygenate, MTBE, rather than renewable ethanol. If additional states follow the direction of

California Governor Davis, or if this panel recommends a gradual MTBE phase-out, capital will flow to ethanol production projects immediately. Moreover, several companies producing ethanol today have investment capital of their own, which could be used to finance production expansion. Industry sources indicate that such expansions could easily add another 600 million gallons of ethanol production capacity within 12 to 18 months, and would likely add more. You should know that ethanol production facilities are largely modular. Expansions can be done very quickly by simply adding new equipment to existing production streams.

But as noted by the list of proposed facilities in Table 2, I believe most new production will come from new participants in the industry, either grain processors not currently in ethanol production or additional farmer-owned cooperatives similar to the one which we have partnered with in Aurora, Nebraska. Moreover, we believe the next generation of ethanol production facilities will include production from cellulose and biomass feedstocks. Earlier this year, there was a groundbreaking for a new ethanol production plant in Jennings, Louisiana which, when completed, will produce ethanol from rice hulls and bagasse. Three other plants are currently planned in California that will produce ethanol from rice straw. Already, ethanol is being produced from wood waste by Georgia Pacific in Washington state, and production from forest residue is not far behind. None of this will happen, however, without the assurance of increased market opportunities for ethanol in RFG. If MTBE continues to dominate the RFG oxygenate market or if the oxygenate requirement itself is repealed, there will be little increased ethanol production in the coming years.

Table 2
Proposed Ethanol Plants in the U.S.

Location	Size (million gpy)	Feedstock
Macon, Missouri (under construction)	15	Corn
St. Joseph, Missouri	15	Corn
Blairstown, Iowa (under construction)	9	Corn
Pearl City, Illinois	30	Corn
Great Falls, Montana	30	Wheat, barley
Washington	40	Grain
Illinois	100	Corn
Iowa	n/a	Corn
California	15	Forest Residues
Gridley, California	30	Rice Straw
Sacramento, California	30	Rice Straw
California	30	Rice Straw/Grain
New York	10	Municipal Solid Waste
Louisiana (under construction)	20	Bagasse
Oregon	30	Wood Waste
Black Hills, South Dakota	12	Forest Waste
Totals 16 Plants	426+ million gpy	

Source: Bryan & Bryan Inc., April 1999

In summary, the U.S. ethanol industry has 1.8 billion gallons of existing ethanol production, could add at least 600 million gallons of production capacity through expansions at existing facilities

within 12-18 months, and has identified more than 400 million gallons in announced new production facilities currently planned which could be on-line within another 24 - 30 months. That's a total of 2.8 billion gallons of production that we can currently identify. With the assurance of demand, additional new production capacity will be identified and, as noted, additional production from cellulose will provide tremendous new production potential. Ethanol supply is NOT an issue.

Air Quality Issues:

Nobody questions the air quality benefits of the existing RFG program. But the panel must consider what the impact on air quality will be if ethanol is used more widely in RFG or, alternatively, if non-oxygenated RFG fuels are used. With regard to the air quality impacts of ethanol fuels, it must be reiterated that under the existing program, ethanol blended RFG must meet the same volatility and VOC reduction requirements as MTBE-blended RFG. Therefore, **the environmental benefits of ethanol-RFG are the same as, or better than, MTBE-blended RFG.** As noted recently in a report by the American Lung Association of Metropolitan Chicago:

> *"oxygenates like ethanol help fuels burn more completely, thereby reducing emissions of carbon monoxide, volatile organic compounds, and toxic air emissions. Furthermore, oxygenates displace benzene found in conventional gasoline, which reduces emissions of this known carcinogen as well."*

It is important to note that the emissions benefits of ethanol RFG may be better than existing MTBE RFG if 10% ethanol blends are used, rather than 5.7% blends. The reason for this is that with 50% more oxygen and equal volatility, the ethanol fuels will provide significantly greater carbon monoxide and exhaust VOC reductions. For some time, the ethanol industry has been advocating that these additional benefits be recognized and perhaps used to offset some of the VOC penalty attributed to the increased volatility of ethanol fuels. The National Academy of Sciences is reviewing this issue. (A more detailed analysis of the ethanol/ozone issue is attached.) But these are additional benefits that may be attributable only to 10% ethanol blends because of the increased oxygen content of such fuels. If, as we anticipate, 5.7% ethanol blends are used in RFG to replace MTBE, there would be no additional oxygen content and, thus, no offsetting VOC benefits. Refiners would have to continue providing low-RVP blendstocks for ethanol in order to meet existing and phase 2 VOC requirements.

The need for reduced volatility blendstocks will likely increase RFG costs for refiners. But Department of Energy modeling suggests the increased cost is minimal. In addition, modeling by the California Energy Commission has concluded that the cost of producing non-oxygenated fuels which meet phase 2 RFG or CARB standards exceeds the cost of ethanol-blended RFG, and that ethanol RFG may actually *reduce* consumer costs over the long term.

The other issue for the panel to consider, however, is the air quality impacts of non-oxygenated RFG. There are clearly environmental benefits to the use of oxygenates which are not captured by EPA's VOC compliance mechanism -- the complex model. First, oxygenates provide reductions in carbon monoxide (CO) that are ignored by the complex model. The role of CO in ozone formation is becoming increasingly clear, and increasingly important as vehicle technology reduces VOC emissions, leaving CO with a greater percentage of total vehicle emissions. Oxygenates also have a particular benefit with exhaust VOC emissions, particularly with higher-

emitting vehicles. From an ozone perspective, reductions in exhaust emissions are more crucial because of their increased reactivity. Thus, if refiners using non-oxygenated fuels meet the VOC requirements of RFG by further reductions in evaporative emissions, air quality will degrade.

Also, to the extent that non-oxygenated RFG results in increased aromatic content, which seems probable, vehicle combustion chamber deposits will increase, resulting in increased emissions over the life of the vehicle. Finally, oxygenates provide reductions in primary and secondary particulate emissions, and other pollutants like peroxyacetyl nitrates (e.g., PAN). A paper discussing the air quality benefits of oxygenates, particularly ethanol, is attached. The bottom line, however, is that without the assurance of the continued use of oxygen, the air quality benefits we have come to appreciate from RFG will be forfeited.

Health Effects/Water Quality Issues:

Ethanol in gasoline is the same kind of alcohol present in beer, wine, and liquor. Ethanol occurs naturally in some fruits, and is made at low levels in the human body. Because ethanol is biodegradable and infinitely water soluble, it will not bioaccumulate. That is, ethanol will not concentrate in organisms that contact it in air, water, or soil. It will not build up in fat, like some environmental contaminants. For all these reasons, and more, we do not believe there should be concerns with replacing a larger percentage of petroleum products with ethanol in RFG.

Nevertheless, I appreciate the desire on the part of some to be extraordinarily cautious, and to assure that if we take steps to remove one problem, we not replace it with another. Thus, I have attached a short white paper which summarizes information about ethanol's health and environmental effects, given ethanol's use as a fuel oxygenate. The conclusions are: (1) ethanol is readily degraded in the environment; (2) anticipated human exposures to ethanol are very low; and (3) voluminous information on metabolism of ethanol by humans, and on the health effects of ingested ethanol, strongly suggests that environmental exposures to ethanol will have no adverse health impact.

Some have questioned whether the increased acetaldehyde emissions from ethanol will exacerbate peroxyacetyl nitrate (PAN). PAN is a powerful oxidant, lacrymator, phytotoxin, and precursor to ground-level ozone. But the levels of PAN recently observed are much lower than were seen in the past and, consequently, there have been no air quality standards for PAN since 1977. Nevertheless, we have attached a white paper describing the relevance of fuel ethanol to urban PAN. In summary, the contribution of on-road acetaldehyde (with no ethanol utilization) to urban PAN is approximately 1 percent. A switch from 100 percent MTBE use to ethanol might increase mobile acetaldehyde emissions by approximately 150 percent, which would imply an increase of less than 3 percent in PAN (from ethanol-related acetaldehyde). It is important to note, however, that this assumes10% ethanol blends are used, if 5.7% ethanol blends are used the impact on acetaldehyde and PAN would be proportionately less. Ethanol itself could also increase PAN emissions an additional 7 percent. Thus, the estimated total increase in PAN from ethanol use is 10 percent. If current maximum PAN concentrations are assumed to still be as high as 10 ppb (data suggests actual levels are much less), then a switch from 100 percent MTBE to ethanol might increase maximum PAN concentrations from 10 ppb to 11 ppb.

The inhalation toxicity of low-ppb concentrations of PAN has not been tested, and there is little information about the human toxicology of this compound at any level (see Vyskocil *et al*., 1998 for a review). Brief exposures to PAN at approximately 120 ppb (0.64 mg/m^3) caused eye irritation in humans, but no pulmonary changes. Rats exposed to about 190 ppb (1 mg/m^3) for three months showed no pathological or biochemical effects, and only mild effects occurred at a concentration of 920 ppb (4.95 mg/m^3) PAN. <u>There is no reason to expect adverse health effects at PAN levels on the order of 10 to 20 ppb.</u>

With specific regard to the groundwater behavior characteristics of ethanol, its biodegradation, and its interaction with the biodegradation of the BTEX chemicals, the Renewable Fuels Association would say the following. Ethanol is infinitely soluble in water and, thus, spills have the potential to impact groundwater. However, recent reviews of the environmental behavior of gasoline oxygenates generally note that ethanol is not likely to accumulate or persist for long in the environment. For example, the Interagency Assessment of Oxygenated Fuels (NSTC, 1997) observes that ethanol is expected to be rapidly degraded in groundwater and is not expected to persist beyond source areas. Ethanol in surface water is also expected to undergo rapid biodegradation, as long as it is not present in concentrations directly toxic to microorganisms (NSTC, 1997; Malcolm Pirnie, Inc., 1998).

In part, expectations of ethanol's degradability rely on experiments that use microcosms of groundwater and soil mixtures to demonstrate that ethanol is rapidly degraded both aerobically (100 mg/l in 7 days, Corseuil *et al.*, 1998;) and anaerobically (100 mg/l in 3 to 25 days, depending on conditions Corseuil *et al*., 1998; 96 mg/l within 30 days, Suflita and Mormile, 1993; 100 mg/l within 14 days, Yeh and Novak, 1994). In these experiments, ethanol generally delays degradation of BTX, but not always, and some investigators (Corseuil *et al*., 1998) caution against generalizations about ethanol's effect on other gasoline components. Whether the delay, should it occur, has any practical consequence is another matter. It should also be recalled that ethanol (like other oxygenates) displaces BTX on the order of 10%, meaning that less BTX will be present in equal volumes of gasoline with ethanol, compared to non-oxygenated gasoline.

Conclusion:

The RFG program has been a tremendous success from an air quality perspective. But we must not trade water quality degradation for air quality improvement. With ethanol, that would not be the case. Through the increased use of ethanol in this important program, we can equal or exceed the air quality performance we have come to expect from RFG, and we can do it without jeopardizing precious water resources. On behalf of the entire ethanol industry, I am here to tell you that if it is your conclusion that MTBE does, in fact, threaten water supplies, ethanol can and will supply the oxygenate market. Any other option will forfeit the environmental benefits attributable to RFG, and undermine public support for the program.

Thank you.